

CLAIMS

1. A fluorescent lamp including:
 - a bulb having a bent discharge path, which is formed by connecting a plurality of tubular bodies in series, and a plurality of minute tubes located at the middle of the discharge path and communicating therewith;
 - a phosphor applied to the inner surface of the bulb;
 - filler gas hermetically contained in the bulb;
 - electrodes respectively disposed at the two ends of the bulb in such a manner as to be enclosed in the sealed bulb; and
 - an amalgam enclosed in a minute tube closest to either electrode.
2. A fluorescent lamp as claimed in claim 1, wherein:
 - one of the electrodes attached to the two ends of the bulb so as to be contained in the sealed bulb is a preheating-side electrode, i.e. an electrode disposed at the end where preheating is conducted, while the other electrode is a non-preheating-side electrode, i.e. an electrode disposed at the end where preheating is not conducted; and
 - the amalgam is enclosed in the minute tube which is closest to the preheating-side electrode.
3. A fluorescent lamp as claimed in claim 1 or claim 2, wherein the open end portion through which said minute tube communicates with the corresponding tubular body is narrower than the interior of the body of the minute tube, in which said amalgam is enclosed.
4. A fluorescent lamp including:
 - a bulb having an inner tube diameter ranging from 6 to 9 mm and a bent discharge path, which is formed by connecting a plurality of tubular bodies in series, each tubular body that is located at an end of the bulb being provided with a minute tube formed at the non-electrode end of the tubular body, i.e. the end where an electrode is not disposed;
 - a phosphor applied to the inner surface of the bulb;
 - filler gas hermetically contained in the bulb; and
 - electrodes respectively disposed at the two ends of the bulb in such a manner as to be enclosed in the sealed bulb.
5. A fluorescent lamp as claimed in claim 4, wherein an amalgam is contained in the minute tube that is provided at the non-electrode end of a tubular body located at an end of the bulb.
6. A fluorescent lamp as claimed in any one of the claims from claim 1 to claim 5,

wherein an auxiliary amalgam is disposed in the bulb.

7. A fluorescent lamp as claimed in any one of the claims from claim 1 to claim 6, wherein the tubular bodies of the bulb are positioned in such a manner that the tubular bodies respectively correspond to the three sides of a triangle when viewed in a cross section.

8. A self-ballasted fluorescent lamp including:

a fluorescent lamp as claimed in any one of the claims from claim 1 to claim 7; and
a lighting device for lighting said fluorescent lamp.

9. A self-ballasted fluorescent lamp including:

an arc tube which is formed by parallelly arranging a plurality of U-shaped bent bulbs having an inner tube diameter ranging from 6 to 9 mm in such a manner that the height of the bulb and the length of the discharge path respectively range from 50 to 60 mm and from 200 to 300 mm and that the lamp has a total luminous flux of not less than 700 lm and a lamp efficiency of not less than 60 lm/W when the lamp is lit at the lamp power of 7 to 15 W;

an envelope having a cover that includes a base and is adapted to permit said arc tube to be attached thereto, the height of the envelope ranging from 110 to 125 mm including the height of the base; and

a lighting circuit contained in the cover.

10. A self-ballasted fluorescent lamp including:

an arc tube formed by parallelly arranging a plurality of U-shaped bent bulbs, each of which has an outer tube diameter ranging from 8 to 11 mm, a tube wall thickness ranging from 0.7 to 1.0 mm and a smoothly curved crown;

a cover including a base that is adapted to permit said arc tube to be attached thereto;

and

a lighting circuit contained in the cover.

11. A self-ballasted fluorescent lamp including:

an arc tube formed by parallelly arranging a plurality of U-shaped bent bulbs, each of which has a bent portion and straight portions;

a cover including a base that is adapted to permit said arc tube to be attached thereto;

and

a lighting circuit which includes a circuit board having the maximum width ranging up to 1.2 times the maximum width of the arc tube, said maximum width of the arc tube being the dimension along which the U-shaped bent bulbs are arranged, said lighting circuit contained in the cover in such a manner that the circuit board is positioned with one of its sides facing all the ends of the straight portions of the arc tube and provided with components having relatively

high heat resistance mounted on the side of the circuit board facing the arc tube and components having relatively low heat resistance mounted on the opposite side of the circuit board.

12. A self-ballasted fluorescent lamp as claimed in claim 11, wherein said components having relatively high heat resistance of the fluorescent lamp are chip-shaped rectifying devices.

13. A self-ballasted fluorescent lamp including:

a cover having a base;

a lighting circuit contained in the cover;

a globe having a nearly identical shape as a typical light bulb and attached to the cover; and

an arc tube which is contained in the globe and has three or more U-shaped bent bulbs, each of which has a smoothly curved crown, said U-shaped bent bulbs connected to one another in series and arranged so that their crowns are aligned in a circle and face the inner surface of the globe and that the U-shaped bent bulbs are spaced apart at a distance not exceeding the outer diameter of each bulb.

14. A self-ballasted fluorescent lamp including:

an arc tube formed by parallelly arranging a plurality of U-shaped bent bulbs having an outer tube diameter ranging from 8 to 11 mm, the maximum width of the arc tube, i.e. the dimension along which the U-shaped bent bulbs are arranged, ranging from 32 to 43 mm;

a cover including a base that is adapted to permit said arc tube to be attached thereto;

a lighting circuit contained in the cover; and

a globe having a maximum outer diameter limited in the range from 55 to 60 mm and attached to the cover with said arc tube enclosed in the globe in such a manner that $A2 > A1 \geq A3$, wherein $A1$ represents the minimum distance between the globe and each crown of the arc tube, $A2$ the minimum distance between the maximum diameter portion of the globe and the arc tube, and $A3$ the minimum distance between the base end of the globe and the arc tube.

15. A self-ballasted fluorescent lamp as claimed in claim 14, wherein $A1$ is set in the range from 2 to 8 mm, $A2$ in the range from 3 to 13 mm and $A3$ in the range from 2 to 8 mm.

16. A self-ballasted fluorescent lamp as claimed in claim 14 or claim 15, wherein the outer shape of the lamp resembles a typical light bulb for general illumination.

17. A self-ballasted fluorescent lamp as claimed in any one of the claims from claim 14 to claim 16, wherein the self-ballasted fluorescent lamp includes:

a supporting member for supporting the arc tube; and

a bonding agent for bonding the arc tube, the globe and the supporting member to one another.

18. A self-ballasted fluorescent lamp as claimed in any one of the claims from claim 9 to claim 17, wherein the U-shaped bent bulbs of the arc tube are arranged in such a manner that the cross sections of the U-shaped bent bulbs give the appearance of a triangle.

19. A self-ballasted fluorescent lamp as claimed in any one of the claims from claim 9 to claim 18, wherein:

the distance w_1 between the two straight portions of each U-shaped bent bulb is so set as to be nearly identical to the distance w_2 between each straight portion of a U-shaped bent bulb and the U-shaped bent bulb that is adjacent to said straight portion; and

the distances w_1, w_2 are respectively limited in the range from 1 to 5 mm.

20. A self-ballasted fluorescent lamp as claimed in any one of the claims from claim 9 to claim 19, wherein the lighting circuit includes:

a half-bridge type inverter main circuit having at least a pair of transistors consisting of an N-channel transistor and a P-channel transistor, which are connected in series with each other to an input power supply and serve as the main switching element for generating a high frequency voltage;

a ballast choke connected to the inverter main circuit so as to light the arc tube in stable conditions; and

a control means which has a secondary winding magnetically connected to the ballast choke and shared by the N-channel transistor and the P-channel transistor so that the control means serves to control the transistors by means of the secondary winding.

21. A self-ballasted fluorescent lamp including:

an arc tube;

a cover having a base; and

a lighting circuit that has a circuit board and electrical components mounted on both sides of the circuit board in such a manner that the circuit board is contained in the cover and faces the ends of the arc tube and that the electrical components mounted on the side facing the arc tube are so positioned as to not be aligned with the ends of the arc tube.

22. A self-ballasted fluorescent lamp including:

an arc tube;

a cover having a base; and

a lighting circuit that has a circuit board and electrical components mounted on both sides of the circuit board in such a manner that the circuit board is contained in the cover and faces the ends of the arc tube and that the electrical components mounted on the side facing the

arc tube are so positioned as to not be aligned with the minute tubes of the arc tube.

23. A self-ballasted fluorescent lamp as claimed in claim 21 or claim 22, wherein the outer diameter of the circuit board is nearly identical to the inner diameter of the cover.

24. A self-ballasted fluorescent lamp as claimed in any one of the claims from claim 21 to claim 23, wherein the electrical components mounted on the side facing the arc tube are positioned apart from the electrodes of the arc tube.

25. A luminaire including a self-ballasted fluorescent lamp as claimed in any one of the claims from claim 8 to claim 24.